

**ELECTROSTATIC CONTROL OF HELIUM TIDE IN THE
STEP CRYOSTAT**

P.V. MASON, G. GUTT AND D. STRAYER

JET PROPULSION LABORATORY

P. WORDEN AND R. TORII

STANFORD UNIVERSITY

STEP SYMPOSIUM - TESTING THE EQUIVALENCE PRINCIPLE IN SPACE

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PISA, ITALY

| BACKGROUND

PETRAC, ISRAELSSON AND JACKSON (1987)

DEMONSTRATION OF FORCES EQUIVALENT TO 0.2 G AT SUPERFLUID

TEMPERATURES

ELECTRIC FIELDS UP TO 3 MEGAVOLTS/METER

II EXPERIMENTAL APPARATUS AND OPERATIONS

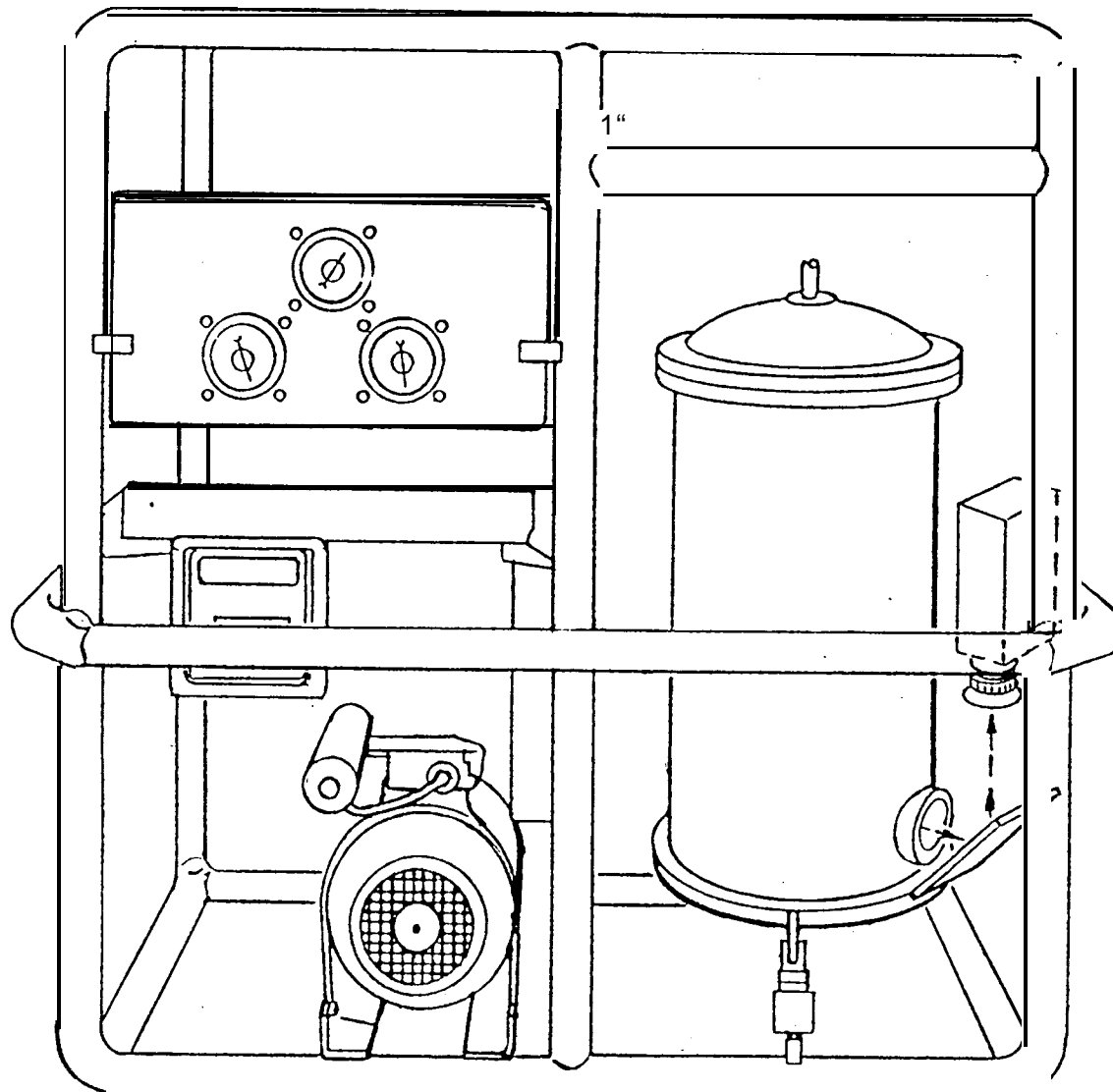
APPARATUS

TEST CELL

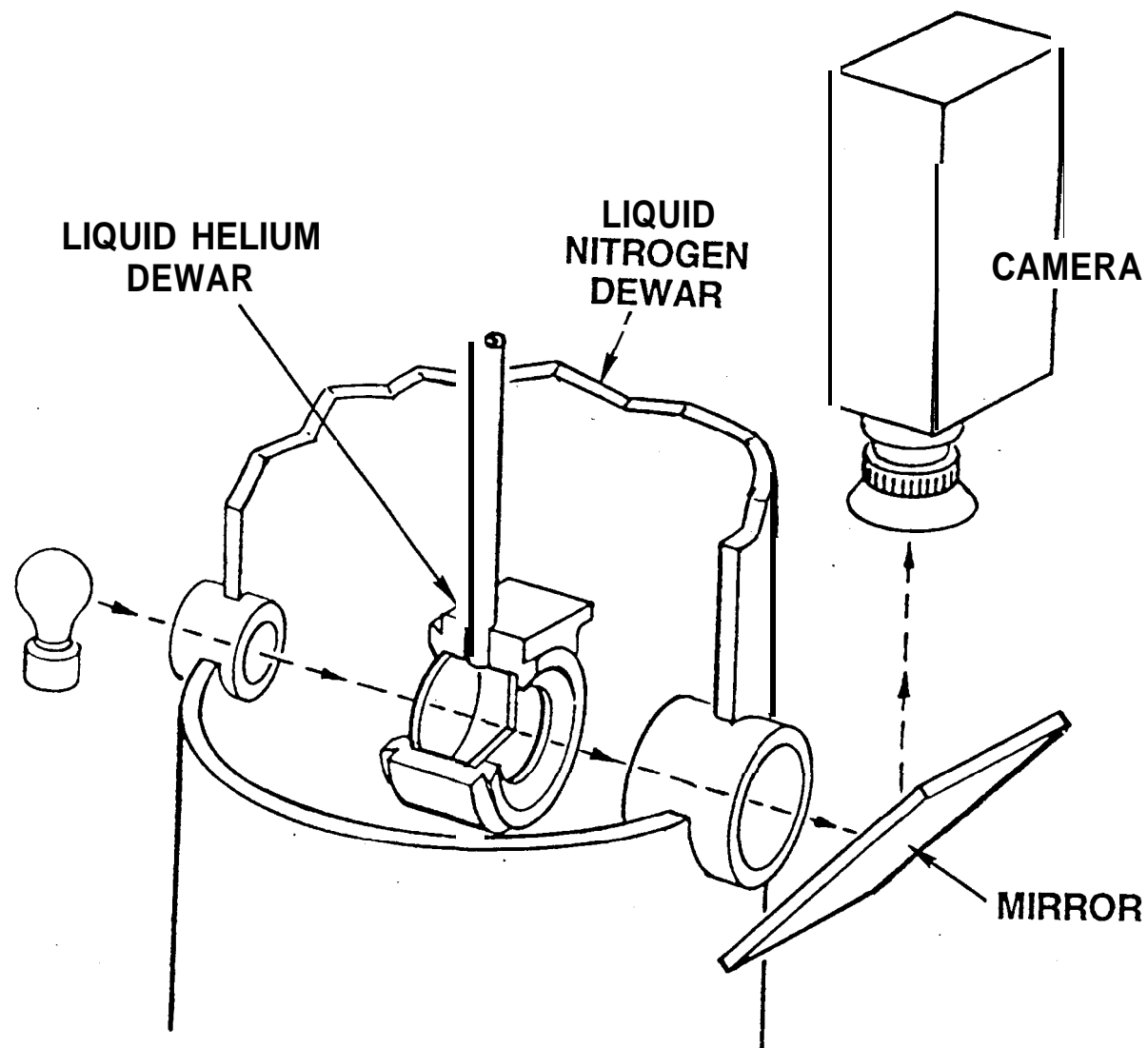
FLOAT PACKAGE

KC-I 35 OPERATIONS

JPL STEP FREE FLYER CONFIGURATION



JPL STEP FREE FLYER DEWAR CROSSECTION



III EXPERIMENTAL RESULTS

FLAT VANES

COMPARISON OF VOLTAGE/NO VOLTAGE

COMPARISON OF 2.1 K VS 1.8 K

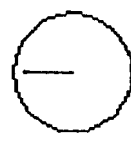
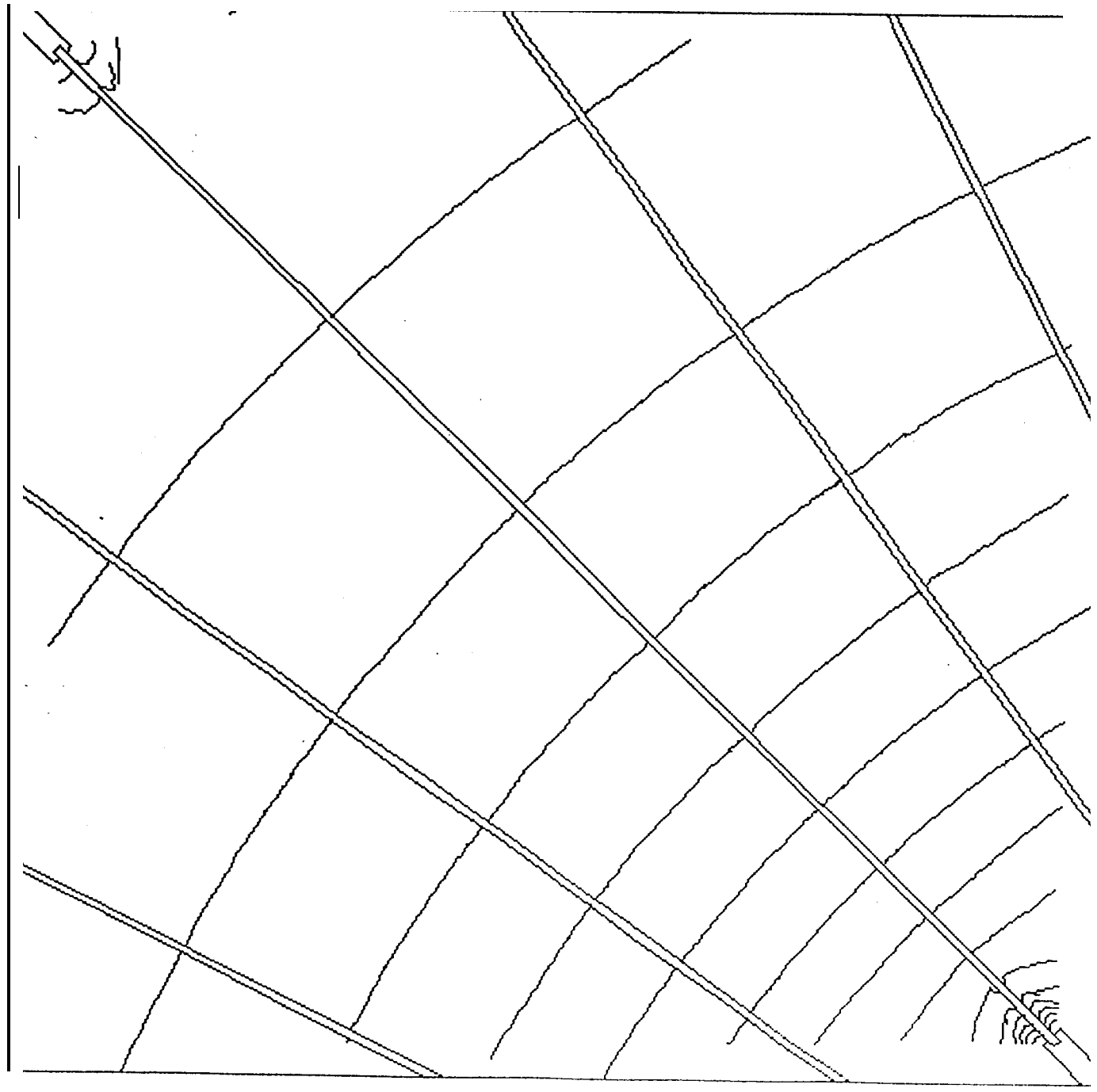
COMPARISON OF SUPERFLUID VS NORMAL

EFFECT OF ACCELERATION

3 M G V S 6 M G

5 OCT 92

FIGURE 6-2: CONTOURS OF CONSTANT E^2

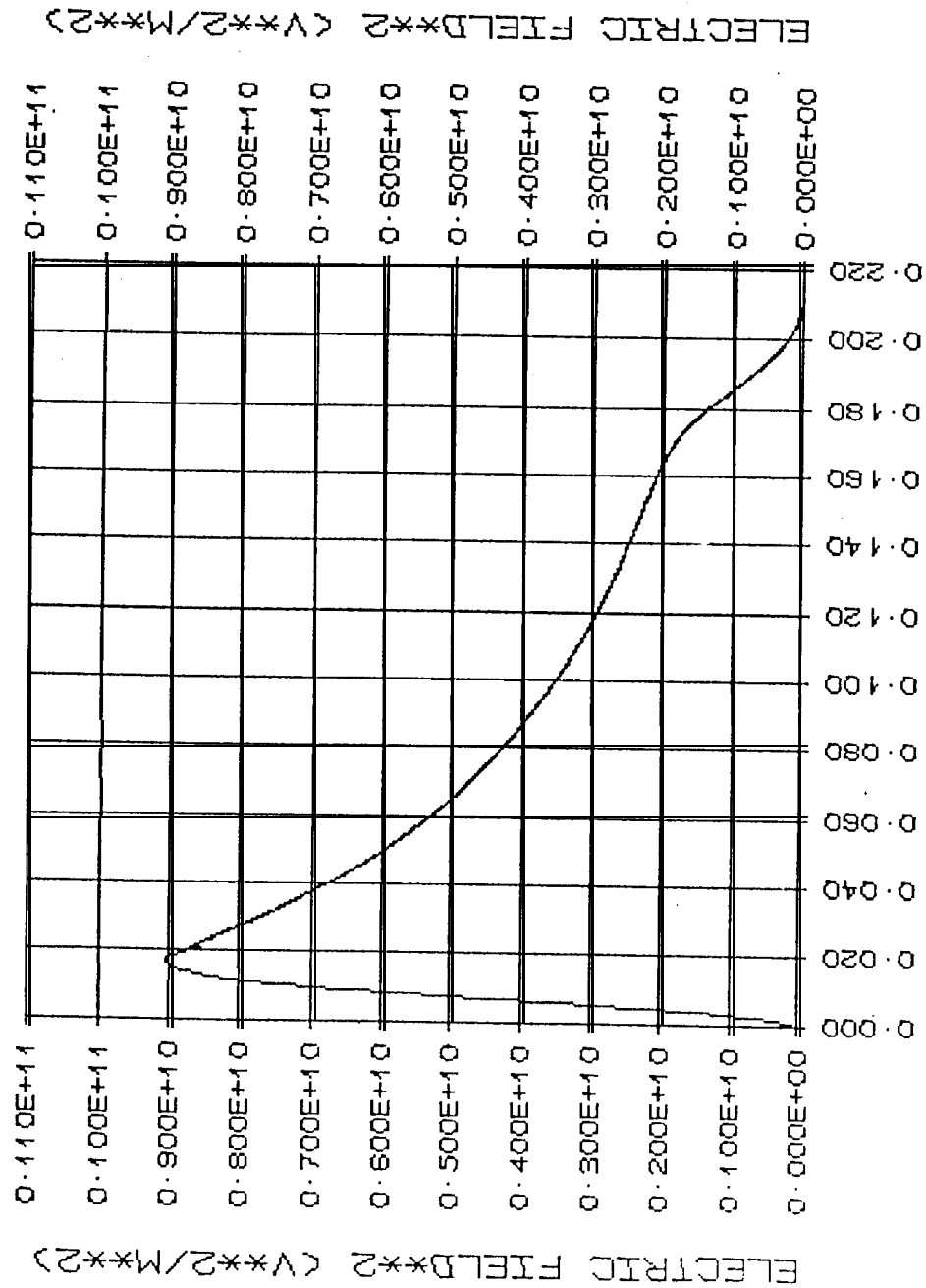


Result

Posted 5.0

153CT92 HE16 E*2 ALONG CONTOUR 4

LEGEND
Curve 1



Result

DISTANCE ALONG CONTOUR (M)

Post 20 5.0

IV ANALYSIS

- JPL COMPUTER SIMULATIONS OF THE ELECTROSTATIC FIELD OF THE KC-1 35 AND FLIGHT CONFIGURATIONS HAVE BEEN DEVELOPED. WE HAVE INCORPORATED GRAVITY GRADIENT AND SURFACE TENSION IN THE MODEL RESULTS.
- TORII HAS PERFORMED ANALYTICAL STUDIES

V CONCLUSIONS

- ELECTROSTATIC FORCES CAN CAUSE THE LIQUID HELIUM TO ASSUME THE DESIRED CONFIGURATION
- ELECTROSTATIC FORCES CAN KEEP THE FLUID IN POSITION WHEN LARGE FORCES ACT
- THE MILLI-G FORCES AVAILABLE FROM ELECTROSTATICS ARE LARGE ENOUGH TO SUPPRESS THE LHe TIDES BY A FACTOR OF AT LEAST 10³